

# Netting as a BMSB Exclusion Barrier

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Northeastern   

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# History of Nets in Orchards

- ✓ Hail nets
- ✓ Shade nets



Hail-damaged fruit



Sunburned fruit



# Types of Net Structures

**Top-cover only**



**Tree wrap**



**Drive-in enclosure**





# Net Enclosures Expand in Washington





# Multiple Functions



- ✓ Reduce heat stress
- ✓ Eliminate overhead cooling
- ✓ Improve fruit size, skin color
- ✓ Reduce worker exposure to UV
- ✓ Reduce worker heat stress
- ✓ Equipment-accessible
- ✓ Exclude birds
- ✓ Exclude deer
- Exclude insects?



# BMSB in Eastern WA Tree Fruit

BMSB not yet established as landscape-level agricultural pest in north-central WA





# Washington Species

Natives used as proxies for BMSB



Red-Shoulder Stink Bug  
*Thyanta pallidovirens*



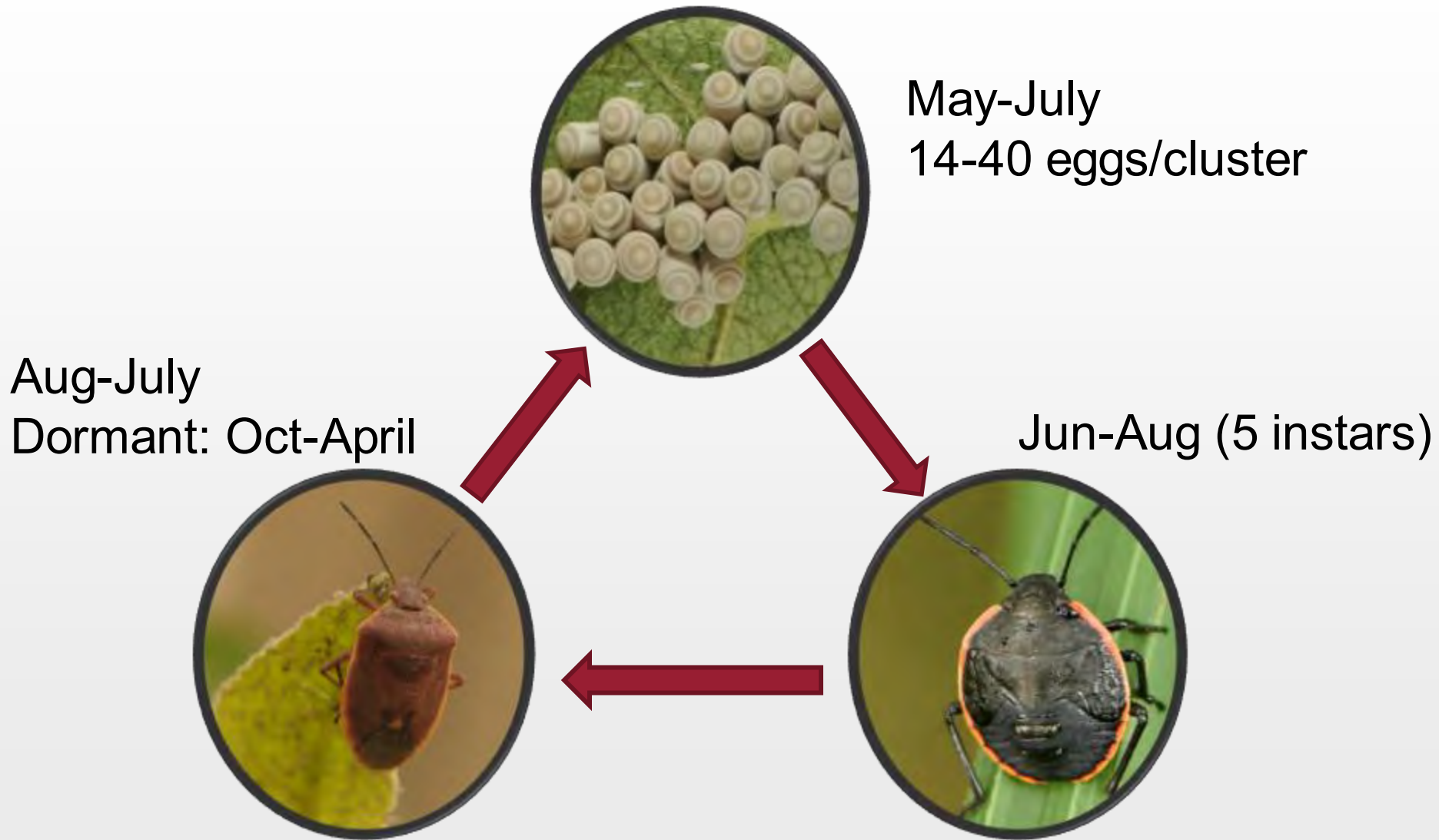
Conchuela Bug  
*Chlorochroa ligata*



Conspere Stink Bug  
*Euschistus conspersus*



# Life Cycle







# Habitat

Washington native stink bugs remain in natural vegetation for the majority of their lives.



Photo: A. Marshall



Photo: J. Hepler



Photo: J. Hepler

(Bordon et al., 1951)



# Behavior

Migration into orchards is associated with vegetation senescence.



(McGhee, 1997)



# Objectives

**Obj. 1: Determine when and how stink bugs migrate into orchard.**



Photo: Capital Press



**Obj. 2: Examine physical exclusion as a control tactic.**



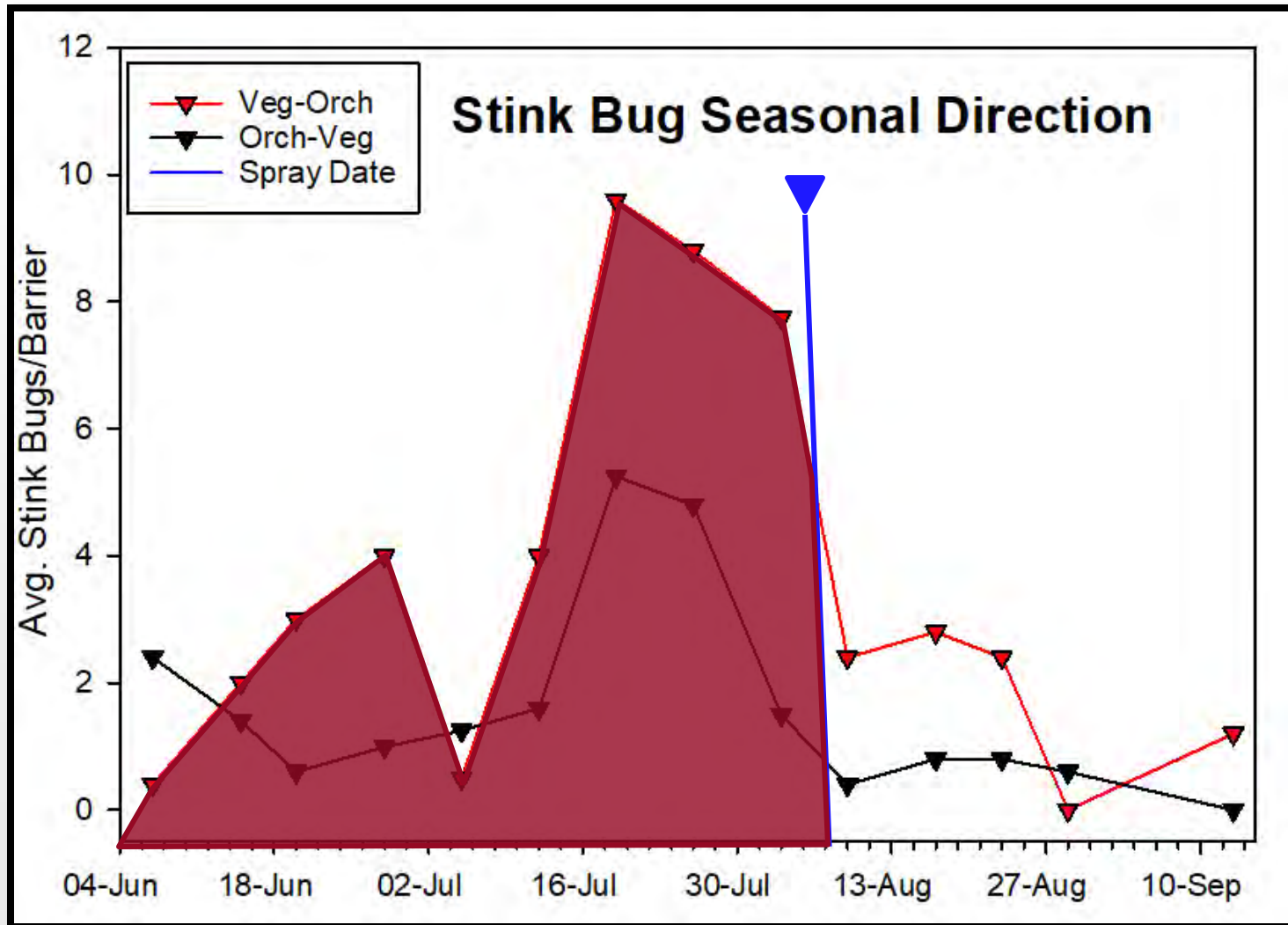
# Experimental Design

- Obj.1:** Determine timing, directionality, and height of stink bug migration.
- 2017: Constructed 5 - 6 x 9 ft sticky barriers.  
\*2018: Increased sticky barriers to 13 ft.
  - Recorded stink bugs weekly by height from 5 Jun – 13 Sep.



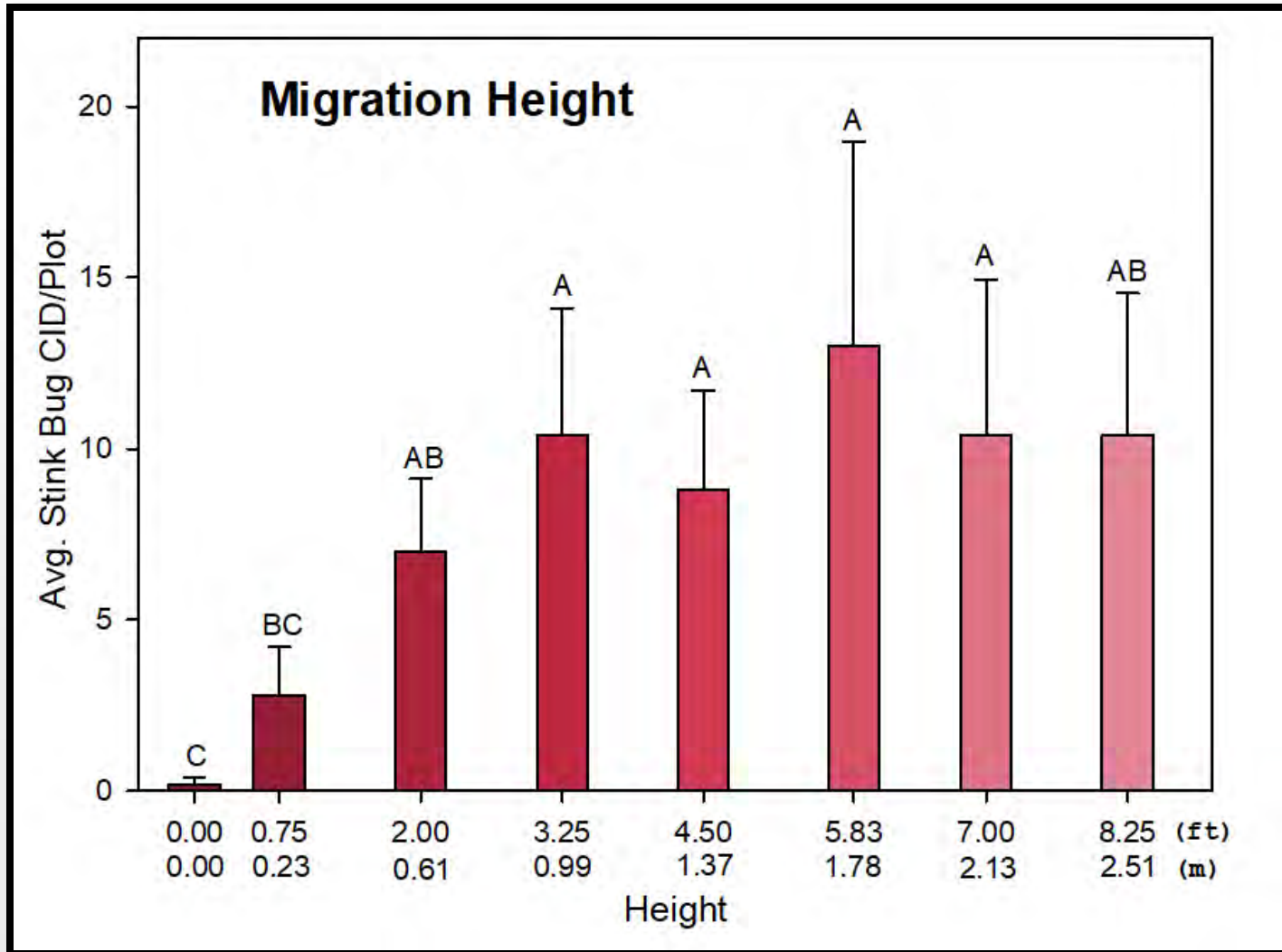


# 2018 Results



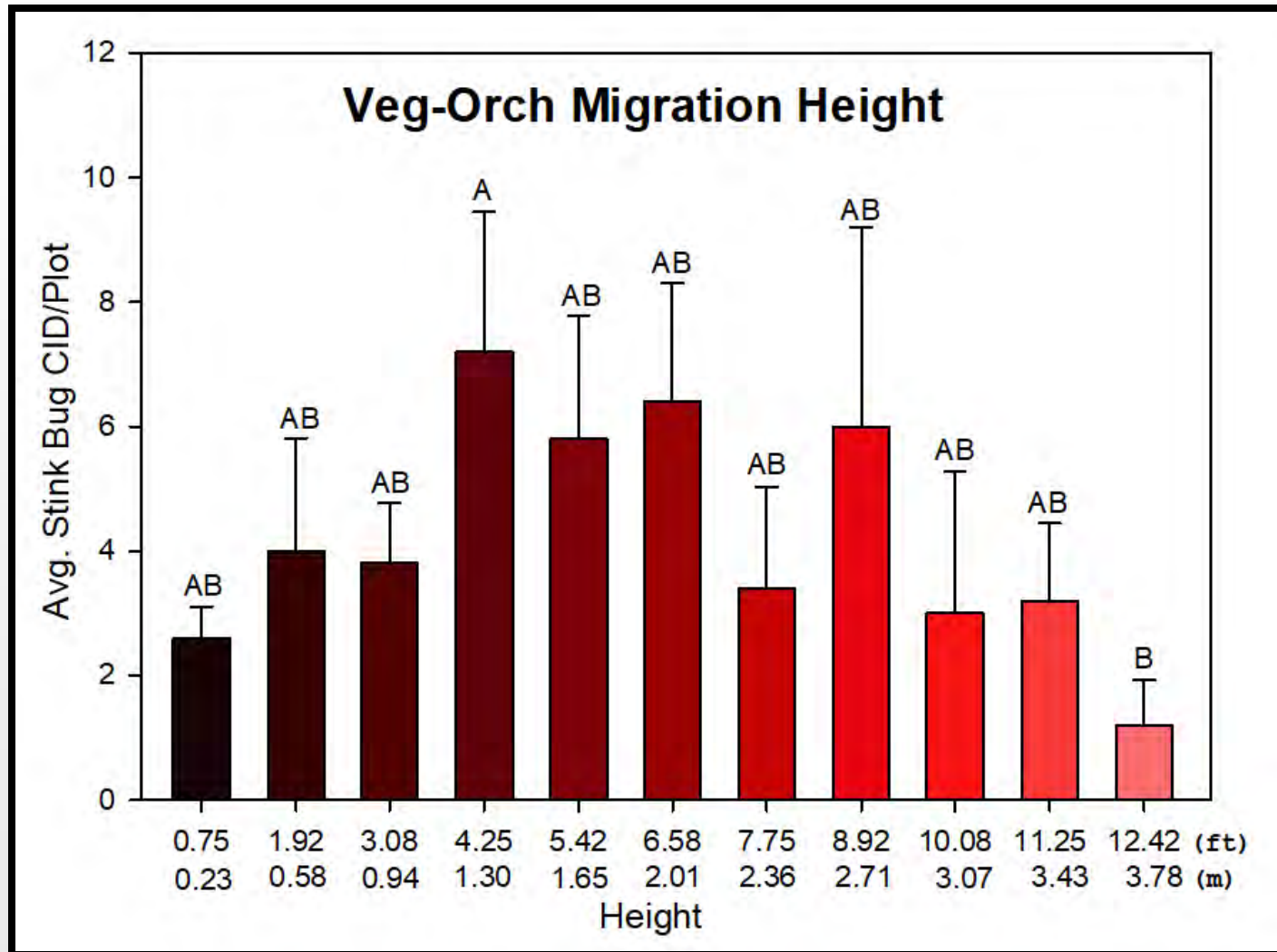


# 2017 Results



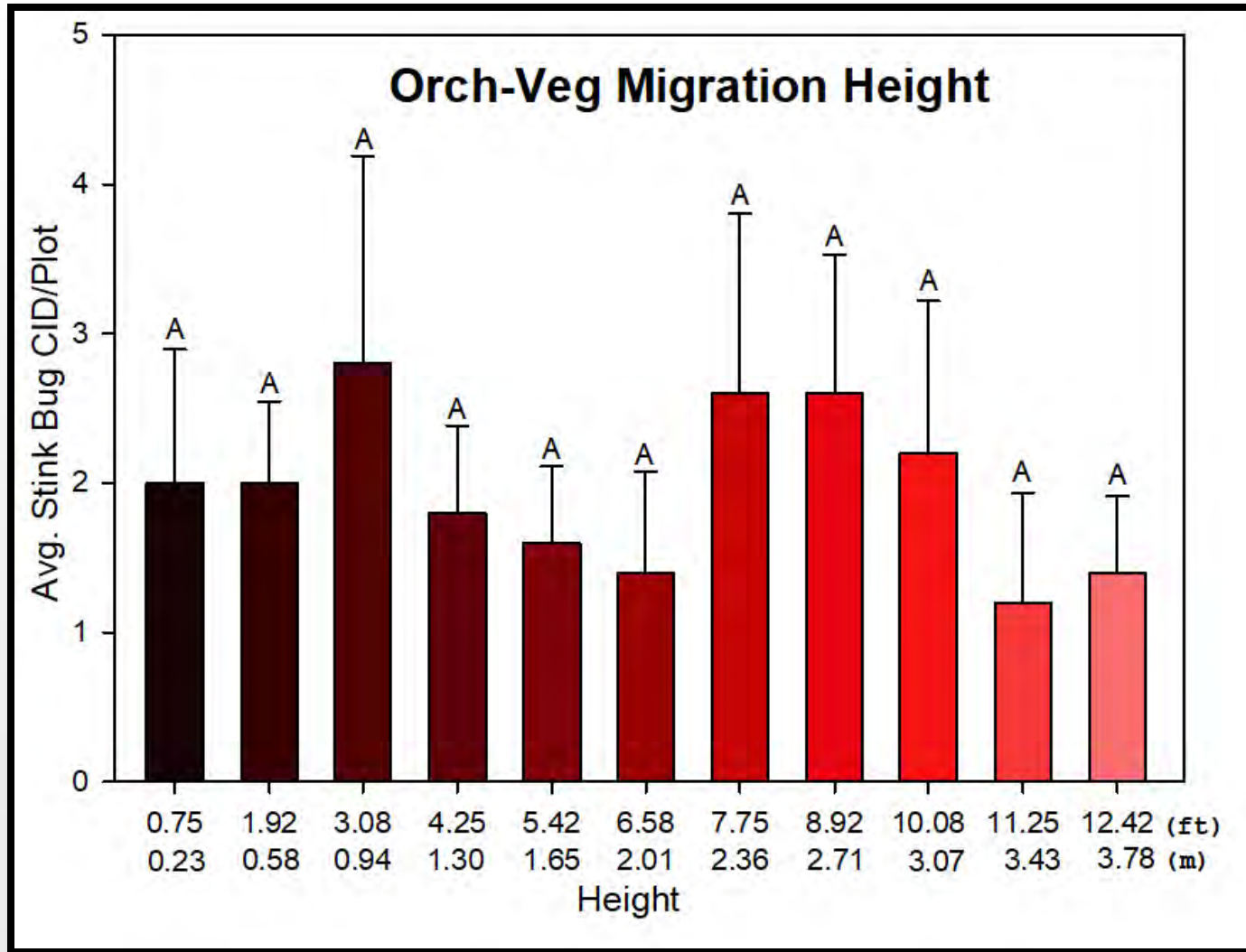


# 2018 Results





# 2018 Results







# Physical Exclusion

**Obj.2:** Evaluate efficacy of shade net barriers to exclude migrating stink bugs.





# Experimental Design

- Constructed 3 -150 x 12 ft (45.72 x 3.65 m) shade net barriers with flaps in 2016.





# Experimental Design

- 3 treatments:
1. Netting with deltamethrin-infused flaps
  2. Netting with non-insecticidal flaps
  3. No net control.

Sampled vegetation and orchard weekly from Jun 1 – Sep 13



### Vegetation:

- Beat sheet sample for 8 minutes.
- Sum all stink bugs by life stage and species.

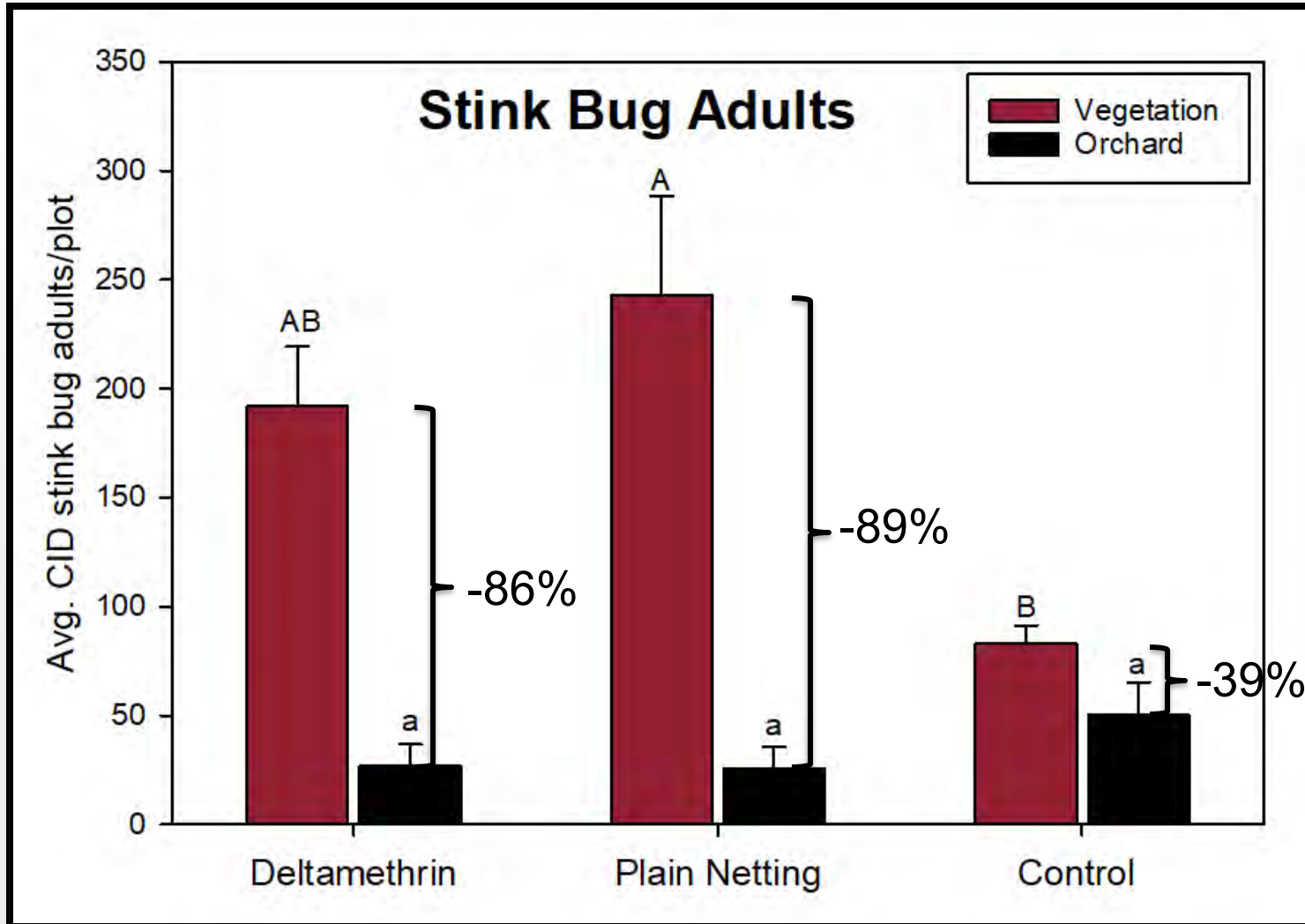


### Orchard:

- Beat sheet sample 10 trees, 4 times each, in each sample area.
- Sum all stink bugs by life stage and species.



# 2018 Results





# Shade Netting Enclosures

## 3 treatments:

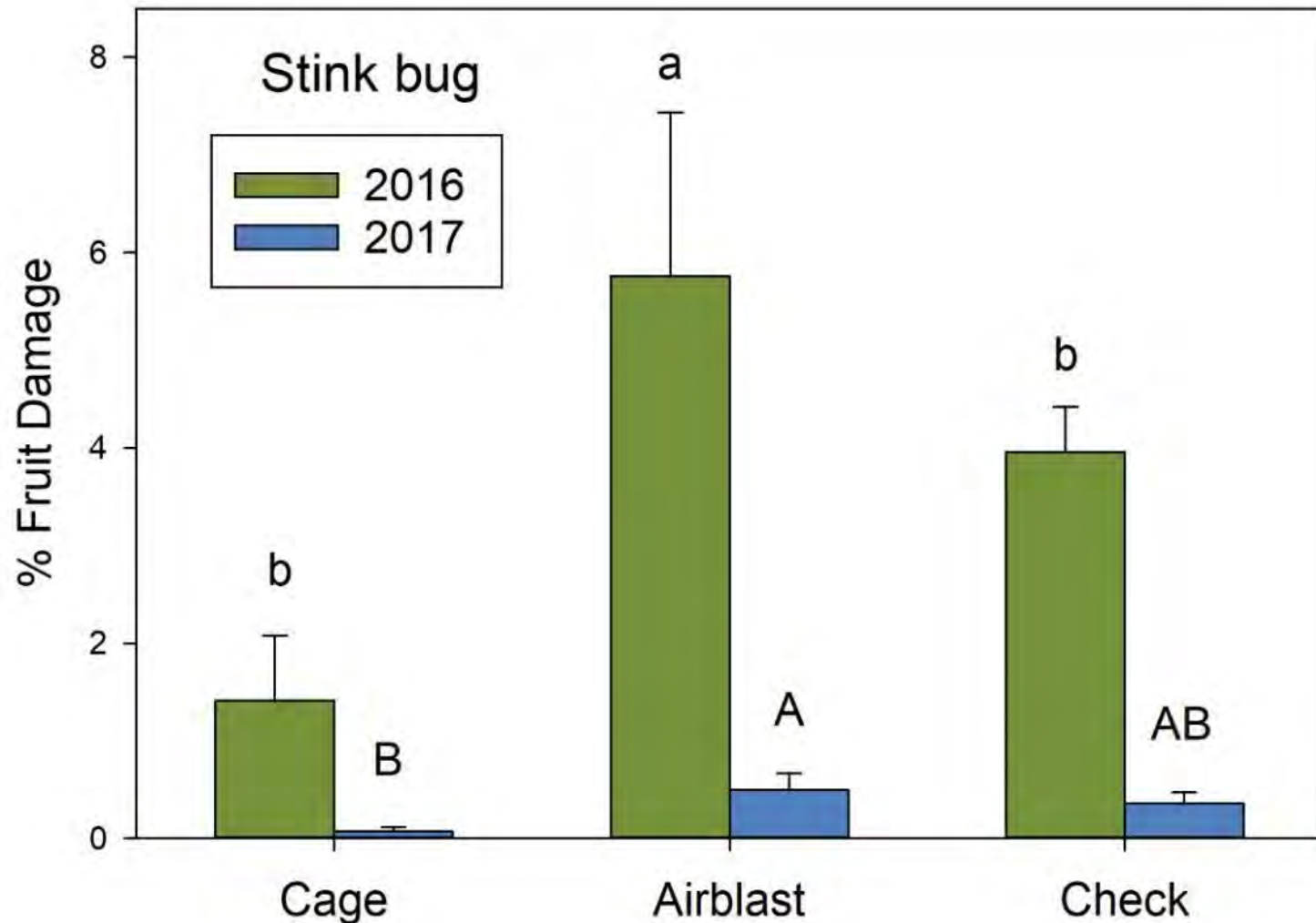
1. Cage
2. Conventional
3. Control (no treatment)

4 replications  
48 trees/plot





# Stink Bug Damage Reduction





# Codling Moth Exclusion



Photo: S. Schoof



Photo: J. Brunner

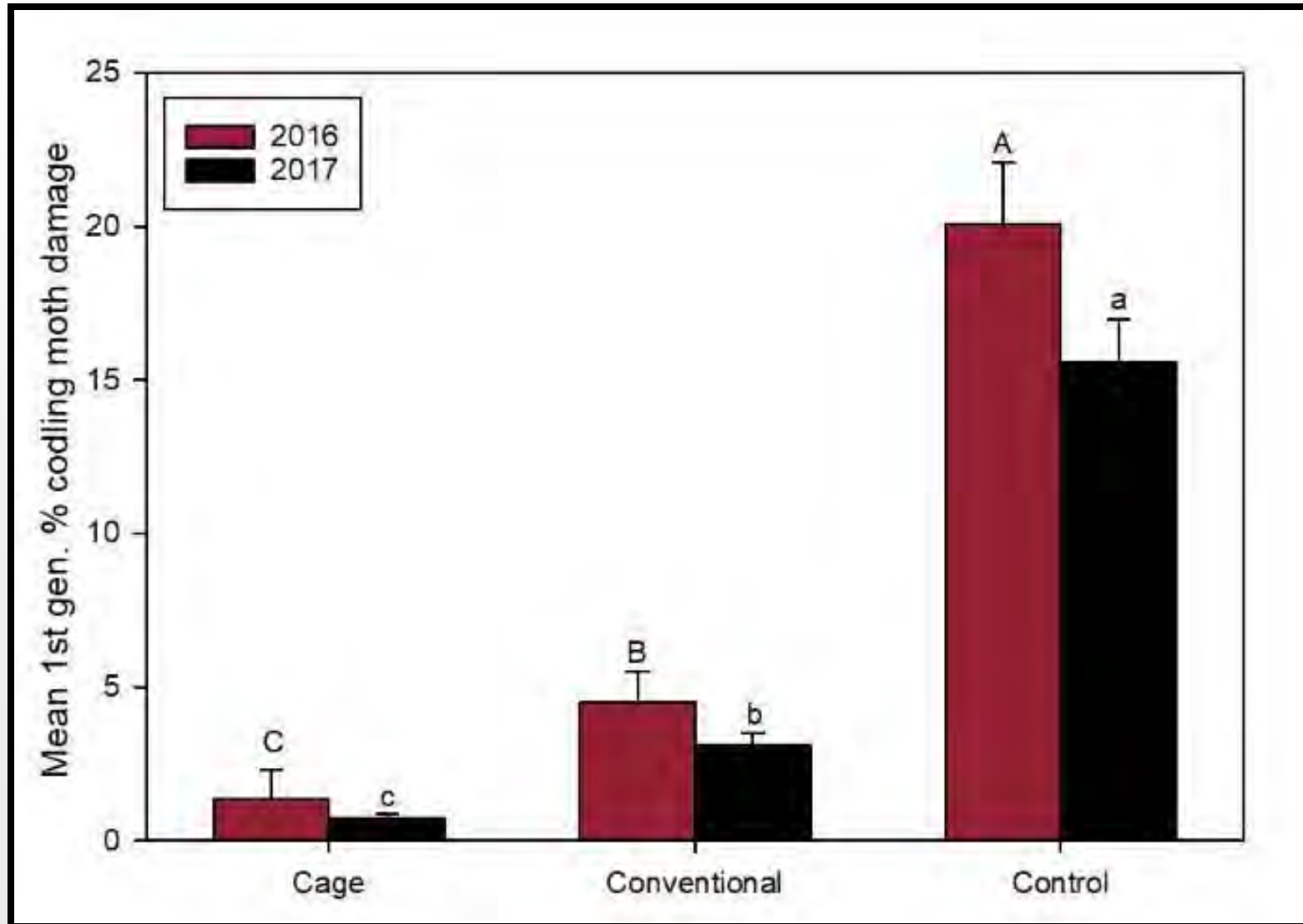


Photo: A. Marshall





# Codling Moth Damage Reduction





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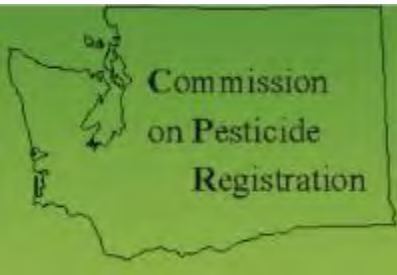
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